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ABSTRACT

Vision is a complex process involving three phases: physical (acuity), physiological (integrative), and psychological (perceptual). Although these phases cannot be considered discrete, they provide the basis for the visual screening procedure used by the Reading Services of Colorado State University and described in this document. Ten tests are administered and analyze far point and near point visual acuity, binocular vision and fusion, ocular motility, muscle balance, depth perception, visual perception, visual memory, and eye hand coordination. The procedure can be used by paraprofessionals with a minimal amount of training and is relatively inexpensive, the materials costing less than 70 dollars. The examiner's record is included in this document. (TO)

Visual Screening: A Procedure*

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VISUAL SCREENING: A PROCEDURE

Educators are aware of the intimate relationship between accurate, healthy vision and academic success. However, our awareness is not often carried into practice. Many of us continue to use a far point vision chart even though we know we are not measuring "reading vision." Others of us have no visual screening procedure at all. Kerstiens (7, p. 78) found none of the over eighty institutions he visited that were designed to effect adult learning to have "an adequate visual screening survey consistently employed on all students seeking help or otherwise being referred to a learning specialist for help."

We felt very smug when we heard Kerstiens' indictment. We were using the Keystone Visual Survey (8) with our students. Then we discovered The Orinda Vision Study (Peters, et.al. 9) which indicates that telebinocular screening is only about 50% accurate and over-refers about 35%. It seemed evident we needed to explore a new procedure.

In reviewing the literature on vision testing we found many procedures, only a few of which are reported here (1,2,5,6,9,10). We have assumed Bing's (4) definition of vision. She suggests "vision - as it operates for learning - is a very complex process having a physical (acuity), a physiological (integrative), and a psychological (perceptual) phase." Although we realize that these phases cannot be considered discrete, they have provided a basis for the development of our procedure.

The phases, the abilities to be evaluated, and the screening devices used are summarized in Table I. Specific procedures and examiner's record follow.

Table I

Phase	Visual Ability to be Evaluated	Screening Device
Visual Acuity	Far point visual acuity	Standard Snellen Chart
	Near point visual acuity	Reduced Snellen Chart
Visual Integration	Binocular vision, fusion	Worth 4 Dot Test
	Ocular Motility	Pursuit Tests
		Saccadic Movements Tests
		Convergence Test
	Muscle balance	Cover Test
		Vertical Posture Test
	Depth perception	Titmus Stero Tests
Visual Perception	Visual perception	Detroit Test of Learning
	Visual memory	Aptitude (3) Subtest 12 -
	Eye-hand coordination	"Memory for Designs"

Colorado State University
Reading Services
Visual Screening Procedure

I. Standard Snellen Chart

Purpose: To determine the far point visual acuity

Procedure: Have the subject stand 20 feet from the well lighted chart. Have the subject occlude the left eye and read the lowest line he can. Then occlude the right eye and read the lowest line. Then have him read the lowest line he can with both eyes. (Three different charts would be best. Then one could be used for right eye, one for left eye and one for both eyes.) Note: Pre-school and primary grade subjects may use the Pointing E Chart.

Response: Record responses on Examiner's Record

Referral: Subjects below 10 years with less than 20/40 vision should be referred. Above the age of 10 years, a subject with 20/30 vision or worse should be referred.

II. Reduced Snellen Chart

Purpose: To determine the near point visual acuity

Procedure: Have the subject hold the card at 16 inches. Be sure to have GOOD LIGHT. Have the subject occlude the left eye and read the lowest line he can. Then occlude the right eye and read the lowest line. With both eyes, have him read the lowest line he can. (Three charts would be best. See note above.)

Response: Record responses on Examiner's Record

Referral: Many subjects up to the age of 10 years may not have developed fine near point visual acuity.

Subjects below 10 years with less than 20/40 vision should be referred.

If the subject has a reading problem and visual symptoms, they might be referred at the 20/30 level if age 7 years or above.

Above the age of 10 years, a subject with 20/30 vision or worse should be referred.

III. Worth 4 Dot Test

Purpose: To determine if a subject has binocular vision. It will also determine if a subject is suppressing the vision in one eye.

Procedure: Place the red-green glasses on the subject with the green lens over the right eye. Hold the flash light about 16 inches away and ask him how many circles he sees.

Response:

1. If the subject reports 4 circles, he possesses binocular vision.
2. If the subject reports 3 green circles, he is suppressing the vision of the left eye.
3. If the subject reports 2 red circles, he is suppressing the vision of the right eye.
4. If the subject reports 5 circles, which include 2 red and 3 green circles, he is having double vision.

Referrals: Refer--2, 3, and 4 responses.

IV. Ocular Motility Tests

Ocular Pursuit

Purpose: To determine the ability to follow a moving target in all directions of visual gaze.

Procedure: Have the subject follow a moving penlight 16 inches from him through his field of vision on a horizontal meridian, a vertical meridian and two diagonal meridians. Instruct the subject to move

his head as little as possible.

Response: The subject should be able to visually follow the light without loss of motion, concentration, re-fixation, or excessive head movements.

Referral: Refer subjects who cannot follow the light or whose tracking is jerky.

Saccadic Movements

Purpose: To determine the ability to shift one's gaze rapidly and efficiently from one point to another.

Procedure: Hold two penlights about 16 inches from the subject and just within his horizontal field of vision. Have the subject look from one light to the other and back again several times (left-right at near). Hold one penlight about 16 inches from the subject and have him fixate on an object about 20 feet away, then to the penlight and back again several times (near-far). Hold one penlight about 10 inches and another penlight about 20 inches from the subject. Have him fixate first on one light then the other several times (near-near). Have the subject select two objects about 20 feet away and about five feet apart. Have him fixate from one to the other and back again several times (far-far).

Response: The subject should be able to shift his fixation from one point to another rapidly and efficiently.

Referral: Refer subjects who cannot shift their gaze rapidly and efficiently or who have excessive head movements.

Near Point of Convergence

Purpose: To determine how near a person has binocular vision

Procedure: Have the subject observe the penlight and start moving the penlight towards him. Ask the subject to tell you when he first sees two lights. Measure that distance. This is called the break. Then start moving the penlight towards you until he sees one light. Measure that distance. This is called the Recovery.

Observe the light reflex in the pupil. It will be centered in both pupils. About the time the subject sees two, the light reflex will not be centered because one eye will diverge out. It will not be centered until the subject sees one and recovers.

Referral: If the subject breaks at a distance of 10 inches or greater, he should be referred. If the subject recovers at a distance of 12 inches or greater, he should be referred.

V. Cover Test/Vertical Posture Test

Purpose: To test for muscle balance

Definition of Phoria: The direction of one eye in relation to the other eye, manifested in the absence of an adequate fusion stimulus.

Definition of Exophoria: The turning out of the two eyes relative to each other in the absence of an adequate fusion stimulus (when the eye is covered, muscles of the eye draw the eye out; when the eye is uncovered, it moves in to fixate on the stimulus).

Definition of Hyperphoria: The turning upward of the two eyes relative to each other in the absence of an adequate fusion stimulus.

Definition of Hypophoria: The turning downward of the two eyes relative to each other in the absence of an adequate fusion stimulus.

Definition of Strabismus or Tropia: The condition in which binocular fixation is not present under normal seeing conditions.

Definition of Exotropia: Strabismus in which the eye turns out.

Definition of Esotropia: Strabismus in which the eye turns in.

Procedure: A. Hold a fixation penlight at about 16 inches. Occlude one eye and then the other and repeat this several times. Observe the movement of the eye after you remove the occluder.

B. Have the subject fixate on an object or light 20 feet away. Occlude one eye and then the other and repeat this several times. Observe any movement of the eye after you remove the occluder.

Note: If the eye moves from out to in, we have an exo movement. If the eye moves from in to out, we have an eso movement.

C. Use Test 2 "Vertical Posture" from Keystone Visual Survey Tests to determine the presence of hyperphoria or hypophoria.

Determination of a Phoria: If you remove the cover and the eye that was previously covered fixates on the light and the other eye remains fixated, we have a phoria. This is true for both near and far. Note: If the eye moves from out to in, we have an exophoria. If the eye moves from in to out, we have an esophoria.

Determination of a Tropia: If you remove the cover and the eye that was covered does not fixate on the light, we have a tropia. This is true for both near and far. Note: If the eye that was covered fixates on the light and the other eye that was fixated moves in or out, the subject has a tropia. If the eye moves out, we have an exotropia. If the eye moves in, the subject has an esotropia.

Referral Criterion: 1. Any tropia should be referred. 2. An extremely high exophoria or esophroia should be referred.

3. An esophoria of moderate magnitude if the patient complains of eye fatigue when reading. Esophoria does cause fatique.

4. Any response outside the expected response area on the "Vertical Posture" test should be referred.

VI. Titmus Stero Tests

Purpose: To test for stereoscopic depth perception

Definition of Stereopsis: Stereopsis is the binocular visual perception of three dimensional space.

Procedure: Have the subject put on the polaroid glasses.

1. Stereo Fly. If the subject is quite young and has trouble following instruction, ask the child to pinch the fly's wings. If the child has stereopsis, he will pinch the wings above the plane of the picture. 2. Animals. This test is also for younger children. Ask the subject if one of the animals is closer to him in Row A. Continue to Row B and C. 3. Circles. This test will determine fine depth perception. Begin at the 1st square and ask, "Which circle is closer to you"? Continue until the subject gives up or misses two in a row.

Interpretation of the Responses: If a subject does not have binocular vision, he will not have stereoscopic depth perception. An example would be a subject with esotropia (one eye turns in) or exotropia (one eye turns out). Subjects with uncorrected low visual acuity at near may have trouble with this test. If the subject does poorly, check the near point visual acuity and see if it is due to this or a muscle problem as described above.

VII. Visual Perception

Purpose: To determine visual perception, visual memory, and eye-hand coordination.

Procedure: Administer Subtest 12 "Memory for Designs" of the Detroit Test of Learning Aptitude as directed in the manual.

Referral: Refer any subjects age 5-10 having a score one or more years below chronological age. Refer any subject over 10 years having a score two or more years below chronological age.

C.S.U. Reading Services
Visual Screening Procedure
EXAMINERS RECORD
VISUAL SCREENING

NAME_____ AGE_____ GRADE_____

SCHOOL_____ DATE_____

EXAMINER_____

Test I.

Standard Snellen		Evaluation/Comments
E	200	
NZ	160	
YLV	120	
UFVP	80	
NRTSF	60	
OCLGTR	50	
UPNESRH	40	
TOREGHBP	30	
FNEGHBSCR	25	
TUHPRUCFNG	20	
PTNUEHUCBOS	15	

Test II.

Reduced Snellen	
E	200
NZ	120
YLS	80
UFVP	60
NSTRF	40
RCLCTB	30
HTVPFRU	20

Test III.

Worth 4 Dot Test

4 circles___ 2 red circles___

3 green circles___ 5 circles___

Test IV.

Ocular Motility Tests

A. Ocular Pursuit

Follows light (well, poorly)

Horizontal_____

Vertical _____

Diagonal _____

B. Saccadic Movements

Left-right _____

Near-far _____

Near-near _____

Far-far _____

C. Near Point of Convergence

Break=_____" Recovery=_____"

Test V.

Cover Test/Vertical Posture

Tropia _____ Exophoria _____

Esophoria _____

Hyperphoria or Hypophoria _____

Test VI.

Titmus Stero Tests

A. Fly (for younger children)

Pinched wings _____

Touched book _____

B. Animals

1. (cat) _____
2. (rabbit) ___
3. (monkey) ___

C. Circles

1. (B)____ 6. (L)____
2. (L)____ 7. (R)____
3. (B)____ 8. (L)____
4. (T)____ 9. (R)____
5. (T)____

Test VII.

Visual Perception

Raw Score _____

CA _____

MA _____

We have presented a visual screening procedure which we feel examines the aspects of vision needed for school learning (see Table I). Our procedure is not offered as a proven, statistically sound instrument, but rather our interpretation of the literature, our discussions with ophthamologists and optometrists, and our work with elementary, secondary, college, and adult students.

Furthermore, we feel that this procedure can be used by paraprofessionals with a minimal amount of training and that it is relatively inexpensive. The materials can be purchased from optical supply houses for less than $70.00. Detroit Test of Learning Aptitude material is available from the publisher. Penlights are available from local stores.

We need emperical proof of the value of this procedure and have proposals and research designs underway. Your feedback on the use of the procedure would be appreciated.

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